

but the measurement of 7.71 inches in 24 hours at Meek is the greatest of record. This occurred from 5 p. m. of the 15th to 5 p. m. of the 16th. The storm beginning at 5 a. m. of the 16th and ending at 11 p. m. of the 16th, gave a measured fall of 9.76 inches for the period, an amount approximating some of the heavy downpours of the Tropics.—*C. E. Linney.*

The accompanying map (fig. 1) shows the distribution of rainfall in Texas as well as New Mexico, September 14-17. For a few coast stations, where rain from the West Indian hurricane began on the 13th, the amounts for this day are included. Where the heaviest winds blew on-shore, the greatest rainfall (12 inches) is a little way inland rather than on the coast, possibly because friction with the land brought the maximum ascensional movement of the air a short distance inland. Another

zone of maximum precipitation marks the Edwards Plateau and High Plains.—*C. F. B.*

INFLUENCE OF TROPICAL CYCLONES ON THE WEATHER IN THE VALLEY OF MEXICO.

(By E. Lopez, Bol. Mensual del Observatorio Meteorol. y Seismol. Central de Mexico, 1916, No. 10, pp. 203-206, map. Abstract reprinted from *Geog. Rev.*, June 1918, p. 508.)

From time to time extraordinary rainfalls have been recorded in Mexico City; in September, 1915, for instance, 3½ inches of rain fell in four hours. These are hurricane rains developing in the rear quadrant of the violent tropical cyclone. In the above article, meteorological conditions during eight such storms are shown in tabular form, the paths of the storms being indicated on a map.

EARLY TEXAS COAST STORMS.

(Condensed from the mms. of "Texas Coast Storms," written by Ben C. Stuart and presented to Dr. B. Bunnemeyer of the United States Weather Bureau at Houston, Tex.)

While severe storms swept the coast of Texas long before the dawn of history, the first authentic record we have dates from September 4, 1766, when, according to the Spanish chroniclers, a severe gale visited Galveston Bay. An Indian mission and presidio called San Augustin de Ahumado had been located in what is now Chambers County, and thought to have been situated on or near Lake Charlotte, which connects with the Trinity just north of the present settlement of Wallisville. The wind greatly damaged the mission buildings, and the water from the bay and river submerged the land, which was only a few feet (probably 6 or 8) above ordinary tide. The disaster resulted in the abandonment of the mission. Lake Charlotte is 6 miles from the mouth of the Trinity River, and more than 50 miles from the Gulf of Mexico. The same spot was submerged during the hurricane of August 16-17, 1915.

As the coast of Texas was uninhabited for many years, save by roving bands of savages—the Opelousas, near Sabine Lake and along Bolivar Peninsula, and the Carancahuas and Cokes from Galveston Island as far west as Aransas, and possibly to the vicinity of the Rio Grande—there is no record of hurricanes until the occupation of Galveston Island by Lafitte in 1817, and the earliest report of one comes from statements made by James Campbell, who was in the service of Lafitte and Col. Warren D. C. Hall, an officer under Gen. James Long, who was operating against the Spaniards, and who visited Galveston Island to attempt to enlist Lafitte in the enterprise, but without success. According to them the island was visited by a severe hurricane, the wind being from the east and northeast, and veering to the northwest. The exact date of the storm has not been preserved, but it was in September or October, 1818. The entire island was submerged, with the exception of a small spot on the east end, near the present site of the State Medical College. Lafitte's huts on shore were badly damaged, and several of the vessels cast ashore or sunk. There is no record of the number of lives lost, if any.

From 1820 to 1836 there was no settlement on Galveston Island, although the Mexicans had built a small frame structure there in 1831 for a customhouse, but it does not appear to have been used for any length of time. In 1821 settlers began to arrive, passing up the bay, and located in the succeeding years at Harrisburg, Anahuac, and other points, but in none of the many records of the period from 1821 to 1836 is there mention of any destructive hurricane on the Texas gulf coast. This does not signify that there was none, but as all of the settlements, with

very few exceptions, were inland, they would not have felt the effects of one to the same extent as the islands.

The year 1837 witnessed the beginning of Galveston, and by October, several buildings were under construction. Immigrants were coming in, and there were 20 vessels in the harbor. There were no wharves, and the Mexican customhouse was the only building on the island, the population being sheltered in tents and sod huts. On the 1st of October an easterly gale began blowing and continued with more or less intensity until the 6th, causing a very high tide and submerging most of the island. The wind then suddenly veered to the northwest and swept the waters of the bay down upon and across the island. The following account is extracted from the *Telegraph and Texas Register* (the first paper printed at Houston) of October 11, 1837:

The late accounts from the seaboard are of the most distressing character. A tremendous gale appears to have swept the whole line of the coast and destroyed an immense amount of property. It commenced on the 1st and increased in violence until the 6th. At Velasco four houses were blown down; the whole country for miles around inundated and all of the vessels in the harbor, consisting of the brig *Sam Houston*, and the schooners *De Kalb*, *Fannin*, *Texas*, and *Caldwell*, were driven ashore; the last named has since been got off and cleared on Sunday last for New Orleans. At Galveston the waters were driven in with such violence that they rose 6 or 7 feet higher than ordinary spring tide. They inundated a large portion of the east end of the island and compelled the soldiers of the garrison to desert their barracks, and seek shelter on the elevated ground near the intended site of Galveston City. The large new warehouse of Mr. McKinney and the new customhouse were completely destroyed and the goods scattered over the island. The brigs *Perseverance*, *Jane*, and *Elbe* were driven ashore, and are complete wrecks; the *Phoenix* is also ashore, but slightly injured, and may be easily set afloat again. The schooners *Select*, *Henry*, *Star*, *Lady of the Lake*, and the prize schooner *Correo*, are ashore, some of them high and dry. The *Tom Toby* (privateer) is a wreck, and the *Brutus* (Texan naval schooner) is considerably damaged. The schooner *Helen* is the only vessel which has received no damage. So far as we have been able to learn only two individuals have perished. The history of this country contains no record of any hurricane which has equaled this, either in the violence of the storm or the extent of the destruction. There is reason to believe that the destructive influence of this gale has extended gradually over the surface of the Gulf; we therefore apprehend that the next intelligence from the United States and from Mexico will be rife with accounts of disastrous shipwrecks. We sincerely trust, however, that neither the calamities of enemy or friend will equal our own.

Col. Amasa Turner, who was present, wrote as follows:

There were about 30 vessels in Galveston Harbor when the great storm commenced on October 1, 1837. It began with a wind from the southeast and held to that quarter mostly for three days; then it veered a little to the east and so continued until the sixth day, filling the bay very full and making a 4-foot rise at Houston. On the evening of the 6th, the wind veered to the northeast and blew very strong. The schooner, *Tom Toby*, a privateer, parted her cable and went ashore on

Virginia Point. About sunset the wind, veering all the time to the north, and, if possible, increasing, brought the large volume of water from the bay on to the island with such force and violence as to sweep everything in its course. On land every house, camp, sod house and inhabited structure was swept away, except the old Mexican custom-house. Only one of the vessels held to its moorings.

On the 5th of October, 1842, another hurricane visited Galveston, but the wind was not so high as in 1837, nor the tide, although much of the town (then lower than at present) was flooded, and considerable damage to goods was sustained. The wooden Episcopal Church, on the southeast corner of Tremont and Winnie Streets was blown from its blocks and badly wrecked. A number of other buildings were damaged and several small structures were demolished. No loss of life in the town was reported.

The great gale of September 16-19, 1854, which swept the Texas coast, did not inflict much damage at Galveston, its greatest force being felt to the westward. Of its effect at Galveston the *Civilian* and *Gazette* of September 19 said:

An easterly gale began to blow last Saturday and has continued almost without interruption to the present time. The wind has not been severe, but being from the quarter which always produces the highest tides, the waters of the Gulf and bay have been higher than we recollect since 1842. The floors of a number of stores on the Strand were overflowed during Sunday night, and considerable damage was done to such articles as were deposited on the floor. The little steamer *Nick Hill* was lost off Dollar Point.

The greatest force of this hurricane was felt at the town of Matagorda to the westward of Galveston. Col. R. D. Parks, then residing there, but afterward at Temple, said: "It left a trail of disaster to be recorded in history. Hardly a house was left standing in the townsite or vicinity." Another eyewitness says: "The storm at Matagorda was September 18, 1854. The water from the bay did not come over the town. Two people were killed. The steamer *Kate Ward* and crew were lost in Matagorda Bay—from report it was said at Dog Island."

The great hurricane of August 10, 1856, was felt but little at Galveston, but l'Île Dernière, or Last Island, a summer resort on the Louisiana coast, was engulfed, with the loss of many lives.¹ The steamer *Nautilus*, from Galveston for New Orleans with 30 passengers, however, ran into the gale and foundered, all hands being lost except a Negro man who clung to a bale of cotton and was cast ashore on the Louisiana coast.

In the latter part of September, 1865, a hurricane struck the town of Calcasieu on the west Louisiana coast. The place was inundated and some eight or ten persons perished. As there was neither telegraph nor rail communication with that place, the report was brought to Galveston by the master of a lumber schooner.

On Wednesday, October 2, 1867, a strong easterly gale commenced blowing at Galveston, which shifted to the northeast during the night, and on the morning of the 3d had attained a velocity estimated at between 60 and 70 miles an hour. There was no Weather Bureau and, of course, the figures were guess work. During the morning of the 3d the waters of the Gulf and bay rose rapidly until much of the city was flooded. The water from the north side came nearly up to Church Street at its

higher elevation, while from the Gulf side it reached nearly to Broadway. The cemeteries at Fortieth Street and Broadway were inundated, and all the lowland down the island was covered with water. Much damage was done to buildings in the city and more than 30 were destroyed. The lower floors of the stores on the Strand and Mechanic Street were flooded and their contents badly damaged. The brig *Ocean Wave*, from Philadelphia, was cast ashore on the beach near the present site of Fort Crockett, and her captain drowned. The bark *Palace* and the brig *Egarita* in the harbor were driven ashore, as were a number of small craft, and the steamboats *Alice M* and *Sunflower* were wrecked. The trestle of the Galveston, Houston & Henderson Railroad between Eagle Grove and Virginia Point was completely wrecked, and communication was kept up by means of a ferry boat until it was rebuilt, which was not done for several months. There were three lives lost and the property damage was estimated at \$1,000,000, including that to vessels. As previously stated, the gale began from the eastward on October 2, the wind veering to the northeast during the night, and continuing from that quarter until about 2:30 on the afternoon of the 3d, when it lulled temporarily, to veer to the northwest from which point it blew strongly for a short time, the waters receding rapidly, and by 5 o'clock the sky was clear and the wind of only moderate velocity. This hurricane cut a channel 5 feet deep through the low sand flat east of Sixth Street, from the bay to the Gulf, which remained open for only a few months. It also did much damage at the mouth of the Rio Grande and at Brownsville.

NOTE.—The next record I have is of the hurricanes of June 9 and October 1, 1871, but, as the Weather Bureau was then in operation at Galveston, they are omitted.

THE "QUANTICO" OR CHRISTMAS TYPHOON OF 1918.

By the REV. JOSÉ CORONAS, S. J.

The track of this typhoon is said to be altogether abnormal, a warning for both the seaman and the forecaster. The typhoon is shown to have first moved toward the west by north, then to have inclined northwards whilst to the east of the central part of the Philippines, and finally recurving backward not only to west by north, but to west by south, and even to west-south-west. The slow movement of the typhoon on December 23-24 is said in 99 per cent of the cases to be a sign that the typhoon was recurving north-eastward, especially at the end of December, and to the east of the Philippines. Observations, however, prove most conclusively that the movement was in the opposite direction. The rate of progress of the typhoon was at first about 11 miles an hour, the rate afterwards decreasing to 4 miles an hour or less, whilst after recurving to the west-south-west the typhoon attained its former rate of progress. The vortical calm was probably 15-25 miles in diameter. The area of destruction whilst it was raging in or near Luzon was about 80-100 miles in diameter. A large steamer, *Quantico*, was totally wrecked.¹—From abstract in *Nature* (London), Sept. 25, 1919, p. 79.

¹ The tragic story of this disaster has been told with marvelous skill by Lalcadio Hearn in his "Chita, a memory of Last Island."—C. F. T.

¹ Other typhoons are mentioned on p. 860, below.